EXPLORING THE EFFECTIVENESS OF DEEP LEARNING BASED OBJECT DETECTION IN AUGMENTED REALITY FOR REMOTE LEARNING

SYNOPSIS

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1. INTRODUCTION

The modern industrial age has brought about rapid changes in education, necessitating a transformation in how learning is perceived and delivered. As students' perceptions of the educational system evolve, there is an increasing need for educational platforms to adapt and integrate the interests of learners effectively. To prepare students for future challenges, it is essential for the learner and the learning platform to collaborate seamlessly, fostering an environment that promotes engagement and skill acquisition.

To address this need, a learning factory designed for technical education has been conceptualized and partially implemented. This learning factory incorporates augmented reality (AR) to create microlessons, which are integrated into a didactic system and subsequently into a learning factory app. The platform's compliance, from both student and technical perspectives, is evaluated through established survey parameters and performance indicators. Initial assessments reveal acceptable levels of compliance, with further refinements based on student feedback leading to enhanced compliance. The relevance of the AR-based didactic system is statistically validated using a sample paired t-test, showing significant results at both the 1% and 5% levels.

Building on this foundation, the second phase of research explores the integration of digitally generated features with real-world aspects through augmented reality. Achieving realistic results in AR necessitates solving complex computer vision problems, such as observing real 3D objects and determining scene lighting conditions. This research proposes the use of deep learning to provide precise and dependable solutions for these challenges. By incorporating an estimated posture of the object from the previous timestep into the network, the system can correct issues arising during the closed-loop tracking process. This method leverages a 3D model and tracking device instructions, marking a pioneering application of deep machine learning to 6-DOF dynamic item tracking.

The third phase of research delves into the applications of visual Simultaneous Localization and Mapping (SLAM) in augmented reality, virtual reality, and autonomous

driving. Traditional feature-based visual SLAM systems often face issues with translation and light sensitivity. This research presents a method for object recognition in AR environments, utilizing markers to place and track virtual objects in three dimensions. However, achieving minimal latency and acceptable accuracy on resource-constrained devices like smartphones remains a challenge. By employing the CLAHE (Contrast Limited Adaptive Hierarchical Equalization) technique for image preprocessing, this research enhances feature information extraction and picture contrast. Additionally, a client-server partitioning approach is proposed to achieve high productivity and low latency in multi-user SLAM environments. This robust, feature-based visual SLAM technology operates in real-time with minimal drift and high precision, offering significant benefits for augmented reality applications.

2. LITERATURE REVIEW

Samala et al. [1] employed a systematic review following PRISMA guidelines, analyzing articles indexed by Scopus. It highlights an increasing trend in microlearning research since 2015, reflecting heightened global interest and expert engagement. The survey underscores the theoretical foundations and practical implications of microlearning in the digital era, setting the stage for future advancements. Wolf et al. [2] reviewed the rising expectations for engineering graduates to master emerging technologies and adapt to rapid innovation in the context of Industry 4.0 and digitalization. It explores current educational trends, such as problem-oriented learning and microlearning, as responses to these demands. Additionally, it examines the challenges and gradual modifications in curricula at universities and educational institutions to integrate these novel teaching approaches.

De Giorgio, A., et al. [3] discussed that manufacturing education and training often relied on conventional techniques that separated educational theory from hands-on instruction. As a result, XR-based training was found to reduce training time by 30%-50% compared to traditional methods. Workers trained with XR made 35% fewer errors during practical tasks. Productivity was increased by 25% due to the training. However, user discomfort and fatigue were reported during VR-based training at a rate of 15%-20%, leading to a lower satisfaction rate for VR-based learning compared to AR-based learning.

Havenga et al. [4] focused on the challenges and strategies of remote learning in higher education, particularly during the COVID-19 pandemic. It explored the effectiveness of various low-cost digital communication techniques, such as Additive Manufacturing, the Technology Pedagogy and Content Knowledge Model, and the Community of Inquiry Model. Emphasis was placed on the practicality of these methods in overcoming budgetary constraints and network connectivity issues to enhance remote learning and teaching. Kim et al. [5] explored existing methods for enhancing display visibility, with a focus on transparent displays and the use of eye illuminance as a novel metric. Prior research emphasizes the relationship between ambient lighting and display luminance, highlighting the limitations of traditional contrast ratio adjustments. This study builds on these findings by investigating the optimal emission luminance for transparent displays in varying lighting conditions, aiming to inform the development of advanced auto-brightness control systems.

Xiong et al. [6] encompassed an in-depth examination of the rapid advancements in high-speed connectivity and computational capabilities that facilitate AR and VR technologies. It highlights the unprecedented challenges in optical engineering, particularly in achieving the high performance of human vision within lightweight, compact near-eye displays. The review explores the innovative solutions provided by lithography-enabled devices and holographic optical elements, which address these challenges more effectively than conventional optics. Arefin et al. [7] highlight the challenges of integrating dispersed virtual and real-world information in optical see-through AR, emphasizing the issue of transitory focal blur during rapid focus shifts. Gabbard, Mehra, and Swan [8] explored similar problems using text-based visual search tasks in AR displays. The study builds upon these findings by utilizing an AR Haploscope to further investigate the impact of focal distance transitions on user performance under time constraints.

Favorskaya et al. [9] highlighted the evolution of Visual Simultaneous Localization and Mapping (VSLAM) from classical computer vision techniques to deep learning models since the 1990s. It underscores the advancements made in various applications, including autonomous driving and augmented reality, while also noting the ongoing challenges in achieving flawless VSLAM implementation. The study emphasizes the shift from discrete processing steps to integrated deep learning

approaches since 2017. Jiang et al. [10] explored advanced visual SLAM and picture segmentation methods to address challenges in augmented reality, such as intricate, large-scale scenes and real-time occlusion. It also examines the integration of machine learning techniques to enhance the capabilities of augmented reality systems. The study highlights the limitations of fundamental methods and shows potential solutions for improving visualizations in augmented reality.

Lee et al. [11] highlighted the evolving need for real-time interaction between physical and virtual spaces due to advancements in augmented reality technologies. Existing research typically employs marker-based tracking techniques for recognition and location estimation, which can become spatially constrained. Recent studies emphasize the potential of using RGB-D cameras and point cloud mapping to overcome these limitations, enabling more effective object recognition and positioning in augmented reality applications.

Chen, S., et. al. [12] investigated the impact of real-world environments on the color appearance of virtual stimuli in augmented reality. The effects of ambient lighting and background variations on color perception were analyzed. It was found that virtual colors appeared differently depending on real-world lighting conditions and surrounding colors. Experimental evaluations demonstrated that color consistency and accuracy were influenced by environmental factors. Challenges related to color calibration and perceptual differences were identified. Overall, the study showed that real-world conditions significantly affected the visual appearance of AR-generated virtual stimuli.

Hedili, M. K., et. al. [13] introduced A live pupil monitor with minimal latency and pinhole imaging is used in a new head-mounted display configuration. The display creates a pinhole display illusion by concentrating on the viewer's pupil using Transmissive LCD with a single LED backlight. A vivid, full-color display with a brightness of 360 cd/m2 is the outcome of this. For the eyebox to track the viewer's pupil, it must be steerable. This is accomplished by using a real-time pupil tracker in conjunction with an array of LEDs.The device's 11 msec motion-to-photon latency satisfies the actual-time pupils tracker device criterion. So, the experimental results demonstrate a low latency pupil follower, good light efficiency, and a 37° field of view.

Su, Y., et. al. [14] mentioned that Machine learning techniques based on neural networks are extensively employed to solve detection or object categorization issues with

notable achievements. Object state estimation, which deals with items that have several detachable or changeable sections, is a related problem with unique limits and difficulties. For applications such as robotic assembly and maintenance or Augmented Reality (AR), a system that can determine the present status of such things from camera images can be very important. CNN is presented in this and can recognize and regress an object's pose in many states, then demonstrate the application of this network's output in an automatically generated AR scenario that takes a person along the path building an object made up of several parts.

Jinyu, L., et. al. [15] stated that, although VSLAM/VISLAM has proven successful in augmented reality (AR) applications; the absence of a suitable benchmark makes it difficult to quantitatively evaluate localization outcomes. AR applications encounter a number of difficulties, including dynamic interference, motion blur, rapid motion, and powerful rotation. For a positive augmented reality experience, camera loss frequency should be reduced, and recovery from failure should be precise and quick. Current SLAM benchmarks and datasets only assess camera motions and pose accuracy, which are not relevant to most mobile augmented reality scenarios. A new visual-inertial dataset and AR evaluation standards are being created in order to address this. The authors examine current monocular VSLAM and VISLAM techniques and perform a quantitative assessment of eight exemplary monocular techniques and systems using a benchmark.

3. PROBLEM DEFINITION

In the modern world, the educational process is constantly changing, and the use of the classic approach to the organization of learning does not allow students to become the intellectual leaders of their Generation and prepare for the Professional activities of the future. To this end, what is required is the development of student-centred learning strategies that can afford to accommodate student's interests as well as promote participation. However, it can be said that the realization of Augmented Reality (AR) for enhanced learning faces several challenges. New problems with computer vision, like precise identification of 3D objects' position and evaluation of illumination, become obstacles to natural interpenetration between digital and physical environments. Also, there are current challenges of visual SLAM algorithms especially in the translation

element and the light sensitivity which are problematic in delivering reliable AR systems. These issues are compounded by limited resources in the mobile devices which challenge the application of low latency and high accuracy in augmented reality applications. Hence, there is a compelling necessity to implement modern approaches, deep learning and SLAM with more sophisticated features to increase the accuracy and stability of AR in education and other fields.

4. OBJECTIVE OF THE RESEARCH

The major objectives of this research work to design and develop a novel approach for learning factory are discussed as follows,

- To design an educational platform that integrates students' interests to enhance engagement and learning efficiency.
- To evaluating the learners' experience and feedback enables the systematic enhancement of AR-based didactic system, improving its level of compliance overtime.
- To employ deep learning methodologies to address 3D object tracking and lighting conditions' determination in the AR mode.
- To implement a method for versatile augmented reality data rendering using SLAM applications

5. RESEARCH METHODOLOGIES

5.1. Augmented Reality-Based Didactic System for Enhanced Learning in Print Technology Education

This research proposes a didactic system utilizing augmented reality (AR)-based microlessons as a digital subsystem within a learning factory designed for technical education. Due to the large scale of advanced technologies, students benefit from digital and virtual representations of these environments through micro-lessons that are closely aligned with relevant course topics. The first goal of the proposed work was defined as "Facilitating students with a Didactic System for Learning Factory." After developing the augmented reality didactic system, testing was proceeded and assessment. This evaluation was conducted through surveys, with relevant questionnaires distributed to student users. Based on their feedback, a re-evaluation was performed and made performance

enhancements. To determine the significance of the acceptance level of the AR-based didactic system for the Learning Factory in technical education, a quantitative analysis was conducted.

The operational framework of AR and technical education-based educational systems involves printed visuals such as labels, logos, and charts in various scenarios. These serve as targets for AR interactions, focusing on real-world materials and equipment. Each functional unit incorporates these AR targets. An educational application called the Learning Factory has been developed to integrate mini-courses, quizzes, and practice tests. Students have been granted access to this Learning Factory App. When students use their smartphones to scan the AR target at the Learning Factory's AR-enabled locations, the app detects the target, retrieves relevant data, and overlays educational insights. New users can access the Learning Factory App by scanning a QR code at the AR-enabled location, which directs them to the course website for app download and installation. Once installed, the application continues functioning seamlessly after scanning the AR target.

5.2. Deep Learning for Dynamic Object Tracking and Scene Lighting Assessment

Determining the illumination of a scene from a single image is inherently challenging. Pixel values in an image are influenced by numerous factors such as scene composition, materials, lighting conditions, camera characteristics, and any post-processing applied. Separating any one of these components from the others poses a complex inverse problem. It's difficult to capture all aspects affecting lighting in a photograph due to many elements not being directly observable in the image itself. Typically, assumptions about scene morphology (including reflectance properties) are first made available through methods like depth sensors or user input. Then, robust low-dimensional models are often employed to effectively address the issue of isolating illumination.

AR application developed using Unity 3D Engine and Vuforia SDK. Initially, target images were uploaded to the Vuforia Target Management site. Unity Engine was utilized to design the user interface and load the target database. Overlay content, stored in Unity assets, was then assigned to specific target images. Finally, the AR applications were converted into deployable APKs using the Android SDK.

5.3. Enhancing Augmented Reality Object Detection and Rendering through Advanced Visual SLAM Techniques

The proposed system is composed of three main modules: registration, Visual-SLAM, and preprocessing. The Visual-SLAM module determines the camera's location by analyzing each frame and deciding when to add new ones through continuous monitoring. Once the Visual-SLAM module successfully constructs the 3D map, it triggers the registration module to initialize this map. Using the previously calculated position, a dense map is created by merging the point cloud with the RGBD data. This three-dimensional model is utilized to identify the object and determine the transformation matrix. Combining this process with Visual-SLAM converts the camera's position and orientation into the OpenGL positioning system using the ModelView matrices. The final step for achieving full augmented reality is aligning the simulated 3D object with the real-world environment.

6. RESULTS AND DISCUSSION

This study presents a system that allows for simultaneous monitoring of cameras in real-world locations and detecting and estimating item positions in virtual environments. This approach is thoroughly assessed using the ADVIO dataset, alongside other challenging datasets, to ensure its accuracy and robustness in dynamic settings. The research is conducted on a laptop with an Intel Core i7-4710MQ CPU (4-core 2.5GHz), an NVIDIA GTX860M GPU, 16GB of RAM, and 2GB of graphics RAM for the semantic segmentation component.

Real indoor environments, such as shopping malls and museums, are often intricate and dynamic. Most open-source SLAM computations, which assume static settings, are not well-suited for these dynamic environments. The ADVIO dataset is designed to test the limits of existing methods. The ADVIO dataset includes a variety of challenging real-world machine vision standards for visual-inertial systems, featuring twenty-three sequences captured using multiple mobile devices—an iPhone, an Android phone (Pixel), and a Google Tango—in both indoor and outdoor environments. In addition to the ground truth direction, the dataset includes RGB and IMU data.

For comparison, the method evaluates the performance of our proposed method using metrics such as Root Mean Square Error (RMSE), Mean Error, and the Relative Pose Error (APE) standard deviation of the keyframe trajectory. This evaluation ensures that the size data inferred by the visual-inertial system is accurate and reliable. Figure 4 compares the average tracking time in milliseconds (ms) and the number of lost tracking frames between vSLAM and the proposed method across different numbers of features. The proposed method consistently demonstrates lower average tracking times and fewer lost tracking frames as the number of features increases.

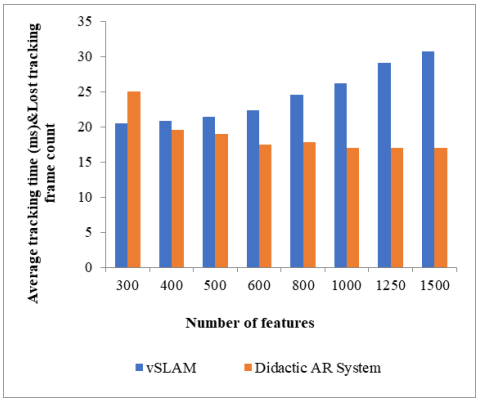

Figure 1. Tracking Time vs. No of Features

In virtual visual data presentations, various colors are used to display object identification results, enabling the overlay of colored virtual data onto real-world objects. Each object's dimensional bounds are accurately surrounded based on its location and rotation, ensuring precise tracking regardless of camera movement. This process results in effective mapping and proper monitoring of virtual visual information, even in localization mode. The results confirmed the accuracy of tracking and the superimposition of virtual data on objects. The comparison result of GPU-accelerated methods with standard server-side ORB-SLAM revealed significant improvements. Figure 5 illustrates the time spent on different tracking stages, including localized point search, feature matching, posture prediction, and feature extraction. Figure 5 shows the Absolute Pose Error (APE) in (mm) versus the iteration count for various methods. The proposed method consistently achieves the lowest APE of 1.5 mm across all iteration counts, indicating superior registration performance compared to ORB, ORB-BREAK, FAST_ORB, and CNN methods.

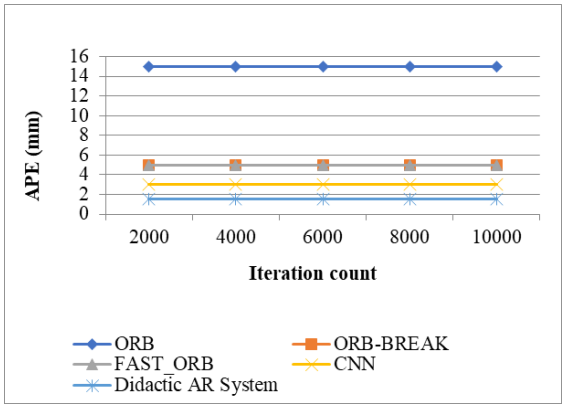

Figure 2. APE Performance for Registration

The method reduces local tracking time by 25-50% (gray blocks) compared to typical ORB-SLAM. SLAM-Share achieves overall tracking latency reductions of about 50% with stereo datasets and 40% with binocular datasets, enabling real-time efficiency at frame rates below 33 ms. The system synthesizes simulated visual data at the precise locations of real-world objects and performs routine monitoring based on camera position. However, its performance can be hindered in cluttered environments due to its reliance on visual input, especially affecting ICPs handling point cloud data. The ICP must ensure object placement accuracy when preparing virtual data for synthesis, making it challenging to align synthetic objects correctly if they are partially or entirely obscured by other objects. Figure 6 displays the Root Mean Square Error (RMSE) in (mm) across various iteration counts for different methods: ORB, ORB-BREAK, FAST_ORB, CNN, and the proposed method. The proposed method consistently achieves the lowest RMSE of 1.5 mm, indicating superior registration performance compared to the other methods.

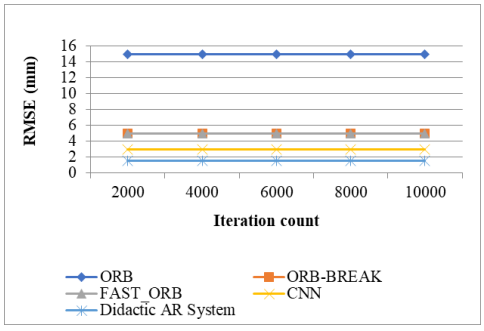

Figure 3. RMSE Performance for Registration

The proposed system can display visual data from a virtual environment by utilizing object identification estimates and real-time camera tracking. The proposed system

can recognize objects in three dimensions, determine their positions, and track them in three dimensions while identifying them in two dimensions and estimating their three-dimensional postures using RGB-D image data. To connect the virtual and actual spaces, we employ a camera tracking technique based on simultaneous localization and mapping (SLAM), which requires sharing two coordinates. The smallest observable entity in a given space is called an object. However, using SLAM alone to create a geographical map makes location estimation and object recognition impractical. The proposed method addresses this issue by incorporating deep learning-based object recognition. Finally, the Iterative Closest Point (ICP) method is used to refine the virtual visual information based on the position and rotational orientation of the real object.

Validation plays a great role in evaluating the effectiveness of the didactic system. It involves a systematic process to ensure that it meets functional, performance and usability requirements before deployment. For the evaluation of AR-based learning didactic system, a comprehensive assessment approach involves quantitative, qualitative, and comparative analyses.

Table 1 Quantitative Analysis of AR-based didactic learning System

AR App Name	User Engagement	Learning Effectiveness	Device Compatibility	Performance
Merge EDU	92%	88%	90%	85%
AR Flashcards	75%	70%	95%	90%
Assemblr EDU	85%	80%	88%	82%
Quiver	78%	72%	85%	80%
JigSpace	84%	85%	92%	88%
Google Expeditions	90%	87%	80%	78%
Proposed Didactic AR System	96.6	93	95	92

Table 2 Qualitative Analysis of AR-based didactic learning System

AR App Name	Usability	Content Quality	Immersion & Interactivity	User Satisfaction
Merge EDU	90%	88%	92%	89%
AR Flashcards	85%	70%	65%	75%
Assemblr EDU	80%	85%	80%	82%
Quiver	88%	78%	75%	80%
JigSpace	92%	90%	88%	87%
Proposed Didactic AR System	95	96	93	94

The evaluation reveals that the Proposed AR Learning Application consistently outperforms other existing apps across all analyzed dimensions. Its high engagement,

content quality, interactivity, and user satisfaction suggest it is a strong candidate for educational deployment. On the other hand, apps like AR Flashcards exhibit significant shortcomings in both qualitative and quantitative areas, indicating the need for more immersive and interactive design.

Table 3 Comparative Analysis of AR-based didactic learning System

Metric	Best Performing App	Lowest Performing App	Comment
User Satisfaction	Proposed didactic AR system (94%)	AR Flashcards (78%)	Proposed AR system offers deeper engagement through tactile and visual feedback.
Learning Outcome Improvement	Proposed didactic AR system (96%)	AR Flashcards (74%)	Proposed AR system shows better outcomes in specialized domains.
Ease of Use	Proposed didactic AR system (95%)	Human Anatomy Atlas (80%)	Simpler interfaces cater better to younger students.
Interactivity	Proposed didactic AR system (93%)	AR Flashcards (72%)	Proposed AR system offers object-based interactivity that is more engaging.
Engagement	Proposed didactic AR system (96.6%)	AR Flashcards (75%)	3D manipulation increases student retention.

Comparative analysis reinforces the importance of UI simplicity, content specialization, and tactile engagement in delivering effective AR-based learning experiences.

7. CONCLUSION

Augmented reality (AR) faces significant challenges in expanding usable real-world regions and accurately representing physical surroundings. Identification precision and spatial expansion are intertwined issues that require ongoing research. This study proposes a method for 3D object recognition, tracking, and augmentation that mitigates the spatial expansion problem in AR. Future research will extend in two key directions: enhancing system resilience in low-texture or high-variability scenarios by incorporating line, planar, and semantic features, and integrating complex semantic maps with semantic segmentation to meet navigation demands. This system aims to enable real-time interaction between virtual objects and the physical world. Successfully addressing position estimation and object occlusion issues, which complement our work, could facilitate AR integration with the Internet of Things (IoT). AR offers an intuitive interface for controlling and navigating real objects by projecting digital images onto physical environments, enhancing realism and immersion. The advancements in tracking technology and sensory benefits have applications across various fields, including AI, education, healthcare, gaming, military, and entertainment. One notable application is generating datasets for 3D object learning in AI using AR tracking devices.

8. ORGANIZATION OF THE THESIS

Chapter 1 deals with the introduction of Augmented Reality, computer vision, computer vision in augmented Reality, integration of deep learning with augmented reality and various algorithms used in the research. It also emphasis the objectives, motivation and the research contribution. **Chapter 2** covers a literature review section that gives an overview of studies and technologies in augmented reality, deep learning, and educational systems. **Chapter 3** explains the details of data collection necessary for developing the augmented reality application for remote learning, verification and validation of developed applications. **Chapter 4** describes the description and evaluation of the designed and implemented AR-based didactic system for learning factories in the sphere of technical education. **Chapter 5** investigates the lighting conditions and general rates of the AR in response to environmental luminosity. **Chapter 6** describes AR for Object Detection and Rendering by employing a Visual SLAM with a deep learning method. **Chapter 7** discusses the implementation and evaluation obtained from the augmented reality applications using deep learning techniques. **Chapter 8** gives an overview of the project and makes conclusions based on the findings in the thesis. Future investigations and research directions are also suggested in this chapter.

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Annexure 1

Questionaries for Survey

Name

Age

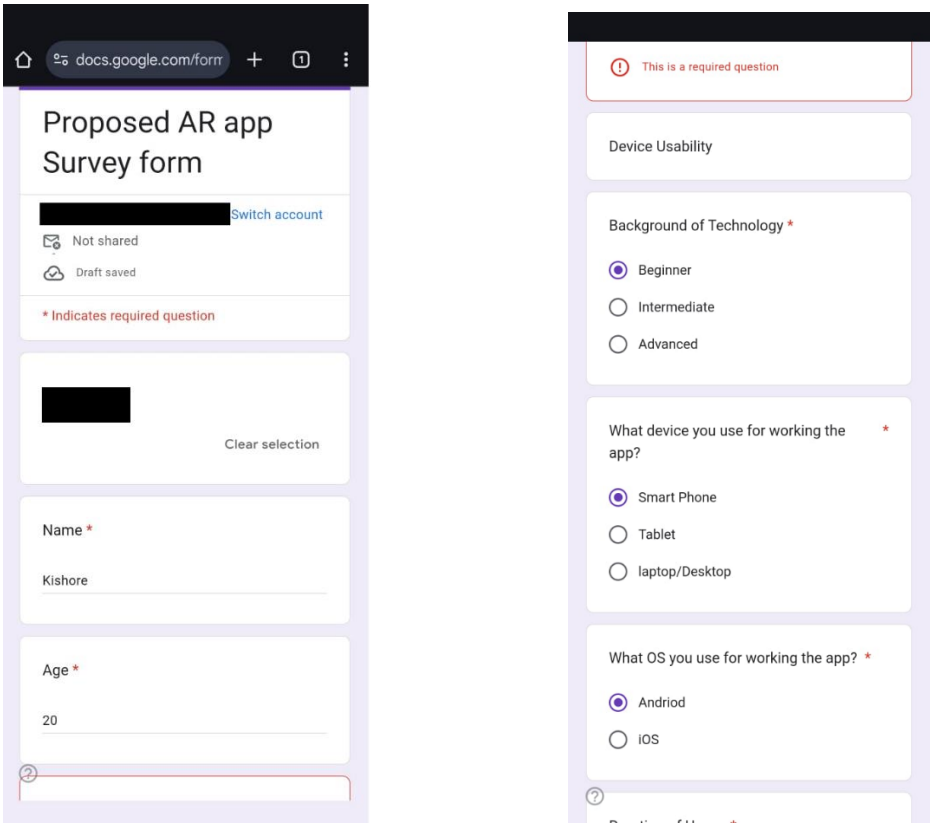
Gender

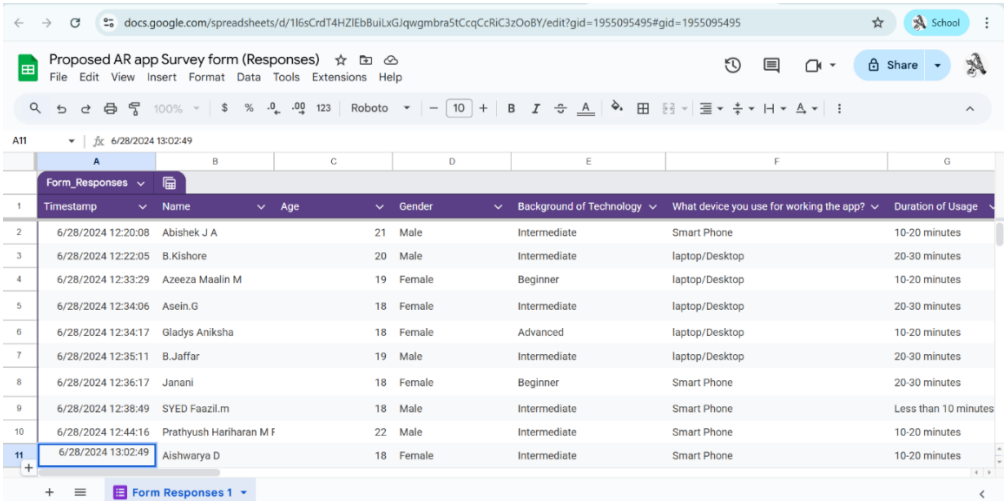
1. Background of Technology Knowledge: Beginner/ Intermediate/ Advanced
2. What device you use for working the app?: Mobile/ Tablet
3. What OS you use for working the app? iOS/ Android
4. Have you used the already existing app(Merge EDU, AR Flashcard, Assembly EDU, Quiver, JigSpace)? Yes/ No
5. Did you face any issue Existing application? Yes/ No
6. Feed back of existing app:

For Proposed Prototype – AR Based Didactic System

7. Duration of Usage: Less than 10 minutes/ 10-20 minutes/ 20-30 minutes
8. Where did you use the application? Class Room/ Lab/ Home
9. How easy was it to navigate the AR application?: Rating Scale 1-5
10. Was the interface intuitive and user-friendly? : Rating Scale 1-5
11. Rate Compared to traditional methods, how effective was this AR tool in enhancing your learning? : Rating Scale 1-5
12. How engaging did you find the AR content?: Rating Scale 1-5
13. Were the interactions (e.g., 3D models, clickable elements) responsive and meaningful?: Rating Scale 1-5
14. Rate the level of immersion (how real and absorbing it felt): Rating Scale 1-5
15. Did the app run smoothly without crashing or freezing? : Yes/ Occasionally Lagged/ Frequently Lagged/ Crashed Often
16. How compatible was it with your device? Yes/ No
17. Did the app load quickly and operate without delays? Yes/ No
18. Overall, how satisfied are you with the AR application? Rating Scale 1-5
19. Would you recommend this AR app to others? Yes/ No
20. Suggestions for improvement:

SCREEN SHOTS





Timestamp	Name	Age	Gender	Background of Technology	What device you use for working the app?	Duration of Usage
6/28/2024 12:20:08	Abishek J A	21	Male	Intermediate	Smart Phone	10-20 minutes
6/28/2024 12:22:05	B.Kishore	20	Male	Intermediate	laptop/Desktop	20-30 minutes
6/28/2024 12:33:29	Azeeza Maalin M	19	Female	Beginner	laptop/Desktop	10-20 minutes
6/28/2024 12:34:06	Asein.G	18	Female	Intermediate	laptop/Desktop	20-30 minutes
6/28/2024 12:34:17	Gladys Aniksha	18	Female	Advanced	laptop/Desktop	10-20 minutes
6/28/2024 12:35:11	B.Jaffar	19	Male	Intermediate	laptop/Desktop	20-30 minutes
6/28/2024 12:36:17	Janani	18	Female	Beginner	Smart Phone	20-30 minutes
6/28/2024 12:38:49	SYED Faazil.m	18	Male	Intermediate	Smart Phone	Less than 10 minutes
6/28/2024 12:44:16	Prathyush Hariharan M F	22	Male	Intermediate	Smart Phone	10-20 minutes
6/28/2024 13:02:49	Aishwarya D	18	Female	Intermediate	Smart Phone	10-20 minutes

Survey Screenshots

List of Publications

Arthi D and S Sivakumari, “Impact of luminous on Augmented Reality Response Time”, Journal of Advanced Research in Applied Sciences and Engineering Technology, Volume 49, No.1,pp 95–107 July 2025 (Scopus indexed).

Arthi D and S Sivakumari, “Augmented Reality based Object Detection and Rendendering using Visual SLAM based Deep Learning Technique”, Soft Computing (Accepted).

Arthi D, S Sivakumari and TKS Lakshmi Priya, “Augmented Reality-Driven Technical Education for Sustainable Industrial Practices and Environmental Awareness”, Journal of Environmental Protection and Ecology (Accepted).

Conferences

Arthi D and TKS LakshmiPriya participated and presented a paper titled “Review on augmented reality application in packaging”, International Conference on Innovative Agricultural Engineering and Food Technology, Sri Sakthi Institute of Engineering and Technology, Coimbatore, Dec 2020.

Arthi D and TKS LakshmiPriya participated and presented a paper titled “ARM-P: An AR Technology-based Simple Approach for Indian MSME Product Promotion”, National Virtual Conference on Rejuvenation of Indian Economy in Pandemic Scenario, Department of Commerce, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Feb 2021.

Arthi D and TKS LakshmiPriya participated and presented a paper titled “AR based Marketing App for Adopting Digital Technology by Self Help Group”, One Day International Virtual Conference on Impact of Covid-19 on Informal Sector, Government Arts and Science College, Coimbatore, Nov 2022.

Arthi D and TKS LakshmiPriya participated and presented a paper titled “Augmented Reality Enhanced Smart Printed Electronic Medical Packaging”, Emerging Trends in Industry 4.0 and Sustainable Concepts, School of Engineering, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Feb 2023.